Lauri A. Schmid-Snoeck February 11, 2010

702.22 Seminar in Applied Theory & Research I

Dr. O’Connor-Petruso

**What is Educational Action Research?**   
   
According to the Action Research Network,

“Educational Action Research refers to taking a systematic look at some educational practice and recording what was done, why it was done, collecting data, analyzing the data and reflecting on how the results might influence future teaching endeavors. If done carefully and thoughtfully, Educational Action Research can improve an individual's teaching. If done by multiple teachers at a single school, it has the potential to enhance the overall quality of the school.” http://actionresearch.altec.org/ 2/11/10.

**Current Educational Issue or Possible research Topic**

I would like to study if the use of a calculator by elementary students could improve their test scores when taking math tests or quizzes. According to the Department of Education website, “Approximately two-thirds of fourth-graders in large city schools reported never using a calculator while taking mathematics tests or quizzes.” ([http://nationsreportcard.gov/math\_2009/district\_context\_3\_district.asp 2/11/10](http://nationsreportcard.gov/math_2009/district_context_3_district.asp%20%202/11/10)).

This statistic was based on the 2009 mathematics assessment questionnaire that resulted in that year’s Nation Report Card. Students in fourth grade were asked a number of questions, including “When you take a math test or quiz, how often do you use a calculator?” to which they were to respond with one answer: “A. Never; B. Sometimes; C. Always”. In New York City the reponse for Never was 74% and Sometimes was 25%. <http://nationsreportcard.gov/math_2009/district_context_3_district.asp>),

In fact, when I was student teaching/substituting, all the classes in my elementary school had calculators in their math corner. However, when covering a math period, most classes told me they did not use the tools (e.g. math cards, calculators, pentominos, Cuisenaire Rods, etc.) The need for intervention is to identify if using a tool, specifically the calculator, will improve students test scores. This is not to say they will have a better comprehension, but it could imply that if used enough, students would be able to interpret the numbers better and understand what happens during certain operations. With the aid of a calculator students who are ‘math averse’ may begin to feel more confident in their math skills, resulting in higher test or quiz scores.

**Is it researchable?**

In that the U.S. Department of Education asked this question, I believe that there must additional information and data available and that this is a researchable subject.

\*Name at least two sources of prior research.

1. U. S. Department of Education;

2. “An Investigation of Calculator Use on Employment Tests of Mathematical Ability: Effects on Reliability, Validity, Test Scores, and Speed of Completion”, [Bing, Mark N.](http://www.eric.ed.gov:80/ERICWebPortal/Home.portal?_nfpb=true&_pageLabel=ERICSearchResult&_urlType=action&newSearch=true&ERICExtSearch_SearchType_0=au&ERICExtSearch_SearchValue_0=%22Bing+Mark+N.%22); [Stewart, Susan M.](http://www.eric.ed.gov:80/ERICWebPortal/Home.portal?_nfpb=true&_pageLabel=ERICSearchResult&_urlType=action&newSearch=true&ERICExtSearch_SearchType_0=au&ERICExtSearch_SearchValue_0=%22Stewart+Susan+M.%22); [Davison, H. Kristl](http://www.eric.ed.gov:80/ERICWebPortal/Home.portal?_nfpb=true&_pageLabel=ERICSearchResult&_urlType=action&newSearch=true&ERICExtSearch_SearchType_0=au&ERICExtSearch_SearchValue_0=%22Davison+H.+Kristl%22). Educational and Psychological Measurement, v69 n2 p322-350 2009

3. “Crutch or Catalyst: Teachers' Beliefs and Practices Regarding Calculator Use in Mathematics Instruction”, [Brown, E. Todd](http://www.eric.ed.gov:80/ERICWebPortal/Home.portal?_nfpb=true&_pageLabel=ERICSearchResult&_urlType=action&newSearch=true&ERICExtSearch_SearchType_0=au&ERICExtSearch_SearchValue_0=%22Brown+E.+Todd%22); [Karp, Karen](http://www.eric.ed.gov:80/ERICWebPortal/Home.portal?_nfpb=true&_pageLabel=ERICSearchResult&_urlType=action&newSearch=true&ERICExtSearch_SearchType_0=au&ERICExtSearch_SearchValue_0=%22Karp+Karen%22); [Petrosko, Joseph M.](http://www.eric.ed.gov:80/ERICWebPortal/Home.portal?_nfpb=true&_pageLabel=ERICSearchResult&_urlType=action&newSearch=true&ERICExtSearch_SearchType_0=au&ERICExtSearch_SearchValue_0=%22Petrosko+Joseph+M.%22" \o "New Search for Author Petrosko, Joseph M.); [Jones, Jane](http://www.eric.ed.gov:80/ERICWebPortal/Home.portal?_nfpb=true&_pageLabel=ERICSearchResult&_urlType=action&newSearch=true&ERICExtSearch_SearchType_0=au&ERICExtSearch_SearchValue_0=%22Jones+Jane%22); [Beswick, Gloria](http://www.eric.ed.gov:80/ERICWebPortal/Home.portal?_nfpb=true&_pageLabel=ERICSearchResult&_urlType=action&newSearch=true&ERICExtSearch_SearchType_0=au&ERICExtSearch_SearchValue_0=%22Beswick+Gloria%22" \o "New Search for Author Beswick, Gloria); [Howe, Carrie](http://www.eric.ed.gov:80/ERICWebPortal/Home.portal?_nfpb=true&_pageLabel=ERICSearchResult&_urlType=action&newSearch=true&ERICExtSearch_SearchType_0=au&ERICExtSearch_SearchValue_0=%22Howe+Carrie%22); [Zwagnig, Kathy](http://www.eric.ed.gov:80/ERICWebPortal/Home.portal?_nfpb=true&_pageLabel=ERICSearchResult&_urlType=action&newSearch=true&ERICExtSearch_SearchType_0=au&ERICExtSearch_SearchValue_0=%22Zwagnig+Kathy%22" \o "New Search for Author Zwagnig, Kathy). School Science and Mathematics, v107 n3 p102 Mar 2007

4. “Does It Add up? Calculators as Accommodations for Sixth Grade Students with Disabilities”, [Bouck, Emily C.](http://www.eric.ed.gov:80/ERICWebPortal/Home.portal?_nfpb=true&_pageLabel=ERICSearchResult&_urlType=action&newSearch=true&ERICExtSearch_SearchType_0=au&ERICExtSearch_SearchValue_0=%22Bouck+Emily+C.%22); [Bouck, Mary K.](http://www.eric.ed.gov:80/ERICWebPortal/Home.portal?_nfpb=true&_pageLabel=ERICSearchResult&_urlType=action&newSearch=true&ERICExtSearch_SearchType_0=au&ERICExtSearch_SearchValue_0=%22Bouck+Mary+K.%22" \o "New Search for Author Bouck, Mary K.), Journal of Special Education Technology, v23 n2 2008-2009

\*What are the pros and cons: name at least two sources.

While out of context with regard to the use of calculators, Marilyn Burns states, “I prefer to find ways to develop children’s understanding, confidence, and skill with computing.” She was referring to allowing students to use their fingers during first grade instruction, as opposed to insisting they do not use their fingers (Burns 366). One would intuit that Ms. Burns would support the use of calculators, as well, so long as it supported student learning and comprehension.

In the Brown et al article, the abstract maintains that “Compared to elementary teachers, high school teachers were significantly higher in their perception of calculator use as a catalyst in mathematics instruction. However, the higher the grade level of the teacher, the higher the mean score on the perception that calculator use may be a way of getting answers without understanding mathematical processes.”

The author’s abstract for the article “Does it Add Up?...”, in the Journal of Special Education Technology, raises implications for calculators as a valid accommodation on assessments.

**Current Instructional Strategies?** Name at least two sources.

Current instruction strategies could be assumed to be direct instruction. “The Direct instruction strategy is highly teacher-directed…is effective for providing information or developing step-by-step skills… for introducing other teaching methods, or actively involving students in knowledge construction” ([http://olc.spsd.sk.ca/DE/PD/instr/direct.html 2/11/10](http://olc.spsd.sk.ca/DE/PD/instr/direct.html%20%202/11/10)).

A second, useful, and often used, strategy is the

“Interactive instruction…[which] relies heavily on discussion and sharing among participants. Students can learn from peers and teachers to develop social skills and abilities, to organize their thoughts, and to develop rational arguments.

The interactive instruction strategy allows for a range of groupings and interactive methods. It is important for the teacher to outline the topic, the amount of discussion time, the composition and size of the groups, and reporting or sharing techniques. Interactive instruction requires the refinement of observation, listening, interpersonal, and intervention skills and abilities by both teacher and students. The success of the interactive instruction strategy and its many methods is heavily dependent upon the expertise of the teacher in structuring and developing the dynamics of the group (<http://olc.spsd.sk.ca/DE/PD/instr/intera.html> 2/11/10)

The these instructional strategies are also described in the Teacher’s Reference Manual for Everyday Mathematics. This is proscribed curriculum used in many New York City Public Elementary Schools. From my brief experience with the curriculum, it was circular in nature in that it would introduce a new concept, but circle back to previous concepts studied earlier to reinforce learning. For extension, it utilized a number of tools, but often there was not enough time to coordinate and exercise the extension, at least as a substitute teacher (I did not know the classroom and could not find the resources necessary; students had never worked with the tools and teaching that would have required more time than I was allotted).

**Practitioners/Theorists?** Name at least two sources.

Of course, Marilyn Burns’s articles and books will be an important resource.

Another resource I have encountered in my perusal of using calculators in the classroom is a book by Len Sparrow and Paul Swan, “Leaning Math with Calculators: Activities for Grades 3-8.”

Again, the U. S. Department of Education has studies relating to professional development and the use of calculators that may prove useful in this Action Report.

Additional practitioners and theorists will be added as research progresses.

**What is your proposed intervention?** (Independent Variable). Name at least one source.

(Since I do not have a class, I will have to recruit some teachers to help me.)

My independent variable is the use of a calculator in the classroom. I would ask that students work with a calculator in conjunction with their work on the operation or concept being studied for a period of time, possibly up to one week prior to test time. Hopefully in that amount of time they would be comfortable using this tool if they have not used it in earlier classes.

**How will you define (construct and measure your intervention?** (Dependent Variable).

Based on the student’s ability, the teachers could divide the class in half having one group of students take a test not using a calculator and the second half with a calculator. Or, if that is not a fair/valid method, take two different classes—on the same academic level—using one as a control. The control class gets no calculator training and does not use a calculator for testing. The second class is trained to use the calculator, as described above in the Independent Variable section, and given a test at the end of the week (or whenever the concept/operation lesson is completed).

If there is a change in grades, the dependent variable, that is statistically significant, my assumption is that it could be inferred that the use of technology or a tool, such as the calculator, could help (or hinder) student learning.